LETTERS TO THE EDITOR.

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Radium and Solar Energy.

The extraordinary discovery that radium has the property of continuously radiating heat without itself cooling down to the temperature of surrounding objects may possibly afford a clue to the source of energy in the sun and stars.

Taking the Curies' observation that one gram of radium can supply 100 calories per hour, I thought it would be of interest to compute how much radium would suffice to supply the sun's output of energy.

Taking from Langley's observations that this is equal to 828,000,000 calories per square cm. per hour, I find that 3·6 grams of radium per cubic metre of the sun's volume would supply the entire output.

It may be possible that at solar temperatures radium is capable of much more energetic radiation, and, if so, the 3·6 grams might be reduced to a much smaller figure.

Daramona, July 1. W. E. Wilson.

"Red Rain" and the Dust Storm of February 22.

In a letter under the above heading which you did me the honour to print in your issue of May 21, vol. lxviii. p. 53, I gave the results of the chemical examination of a sample of dust collected from the roof of Bayham Abbey, Lamberhurst, after the dust storm of February 22, and sent to me by the kindness of Lord Camden, and I stated that it would be interesting to compare its characters with those of the dust, presumably of African origin, which was observed to fall in the district of Taormina by Sir Arthur Rücker, and was the subject of an interesting communication to Nature by Prof. Judd in 1901 (vol. lxiii. p. 514).

Thanks to the kindness of Prof. Judd, who sent me about a gramme of the Taormina dust collected by Sir Arthur Rücker and placed among the geological specimens at South Kensington, I have been enabled to make the comparison.

In external characters the Taormina dust closely resembles that from Bayham Abbey. Its microscopical features are also generally similar.

Mr. C. Simmonds, of the Government Laboratory, to whom I am indebted for the analyses already published, found that after drying at 100° C., the sample had the following composition:—

	Per cent.
Silica	36·32
Alumina	16·35
Ferric oxide, with traces of manganese oxide	6·08
Cobalt oxide	0·32
Lime	6·24
Magnesia	2·21
Sodium oxide	2 59
Potassium oxide	2 72
Water and organic matter	23·49
Chlorides and sulphates	traces
Carbonic acid	3 68
	100·00

The cobalt oxide may include a little nickel, but the quantity was too small to identify with certainty.

After being heated to redness, 28·08 per cent. of the sample was dissolved on boiling with dilute hydrochloric acid, the soluble constituents being:—

	Per cent.
Silica	0·88
Alumina	10·16
Ferric oxide	5·52
Lime	6·24
Magnesia	2·21
Alkalis	2 57
Carbonic acid (by difference)	0·50
	28·08

The organic carbon in the sample amounted to 9·89 per cent., and the organic nitrogen to 0·16 per cent. This small proportion of nitrogen shows that the organic matter is mainly, or entirely, of vegetable origin. Calculated from the mean proportion of carbon in cellulose and humic acid, the amount of organic carbon present in the sample would correspond to about 19 per cent. of organic matter, or, from cellulose alone, to 16½ per cent.

A comparison of the dust from Taormina with the "red rain" dust from Bayham Abbey may be made by calculating the inorganic constituents as percentages on their sum, after deducting water and organic matter:—

	Taormina Dust. Per cent.	Bayham Abbey Dust. Per cent.
Silica	47·47	50·53
Alumina	21·37	20·18
Ferric oxide	7·94	7·23
Cobalt oxide	0·42	—
Lime	8·16	9·50
Magnesia	2·89	2·04
Sodium oxide	3 38	1·27
Potassium oxide ...	3·56	2 53
Carbonic acid	4·81	6·72
	100·00	100·00

Reduced thus to a common basis for comparison, the inorganic portions of the two samples show a general similarity of composition, the chief differences being that the Bayham Abbey specimen contains a little more silica and chalk, and a little less alumina and alkalis, than the sample from Taormina.

The constituents soluble in dilute hydrochloric acid may similarly be compared, after deducting carbonic acid and raising the figures to percentages:—

	Taormina Dust. Per cent.	Bayham Abbey Dust. Per cent.
Silica	3·19	2·28
Alumina	36·84	39 93
Ferric oxide	20·02	19·35
Lime	22·62	29·20
Magnesia	8·01	4·03
Alkalis	9·32	5·21
	100·00	100·00

It is of interest to compare the foregoing results with an old analysis by Gibbs of dust which fell on a ship in the Atlantic (*Pogg. Ann.*, lxxi., 367). After deducting 18·53 per cent. of water and organic matter, the composition was found to be as follows:—

	Per cent.
Silica	45·58
Alumina	20·55
Ferric oxide	9·39
Manganic oxide	4·22
Calcium carbonate	11·77
Magnesia	2·21
Potash	3·64
Soda	2·33
Cupric oxide	0·31
	100·00

Except for the presence in this sample of a notable quantity of manganese and copper, the analysis bears a close resemblance to that of the Taormina dust; the fact of the similarity is particularly interesting, considering that something like half a century has probably elapsed since Gibbs's sample was collected.

Mr. J. J. H. Teall, the director of the Geological Survey, kindly sent me a sample of "blood rain" dust which fell at Palermo at about the same time as the dust from Taormina collected by Sir Arthur Rücker. This closely resembles the Taormina dust in general characters. Mr. Teall has suggested that the question of the origin of the dust might be elucidated if the samples were found to contain free aluminium hydroxide. The bearing of this upon the question of origin is as follows:—Evidence has been recently adduced to show that laterite, a decomposition-product of the felspars, is an aluminium hydroxide, though always mixed with more or less silica. This type of decomposition, it is believed, occurs only in tropical regions, and hence the presence of uncombined alumina in the dust,

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if it could be established, would be evidence of tropical origin.

Following out Mr. Teall's suggestion, the Taormina sample, and also the one from Bayham Abbey, have been examined to see if any evidence could be obtained showing the presence in them of aluminium hydroxide. A study of the actions of solutions of caustic and carbonated alkalis upon the dusts showed that both silica and alumina could be dissolved from them by the former solvent; but similar results were also obtained from orthoclase and oligoclase, whilst the treatment with sodium carbonate showed that no large quantity of amorphous silica was present in either of the specimens. The results are not conclusive, but, so far as they go, they point to there being no uncombined alumina in the samples. T. E. THORPE.

Dust Storms in New Zealand.

AN event of more than ordinary interest occurred here last November, and seeing that it has a certain importance not altogether restricted to us and our neighbourhood, I have ventured to address you on the subject.

From Invercargill, at the extreme south of the South Island, it was reported on November 14 that in various parts of the town and district tank water had a clayey appearance, and exposed objects were covered with a fine dust or mud. A similar report came from many places in the south-east portion of the island, and inland as far as Wakatipu, where heavy gales and thunderstorms are stated to have occurred on that date. At Dunedin no sign of the dust was visible during the day, but in the evening, from 8 to 10 p.m., the moon was at times obscured by clouds of a reddish colour, but the weather kept dry and no dust fell. At Waipawa, near the east coast North Island, a very heavy dust storm commenced at 9 a.m. on November 15. It lasted for several hours, extended, and became very thick. It was not due to local causes.

Samples of the dust examined by a local authority in Dunedin were stated to be of volcanic origin, and possibly connected with eruptions in Samoa or in South Victoria.

Dr. Benham, of the Otago University, kindly gave me a sample of the dust that fell at Otakaia, a few miles south of Dunedin. I submitted it to microscopical and chemical examination with the following result:—

The specimen was in a small bottle with water; it had fallen into a bucket which was quite clean, and in such a position that contamination was impossible. The sediment was of a reddish-brown colour, very fine in grain. A mounted specimen examined with an $\frac{1}{8}$-inch objective showed various vegetable cells, apparently portions of the feathery pappus of fruits of composites and similar light matter. Small rounded grains of inorganic matter were frequent, in some cases large enough (0·03mm. diameter) to depolarise light. They were chiefly quartz, but some were apparently augite, and others particles of weathered minerals coloured red with iron oxides. To these last the colour of the dust in mass was due. There were also in every preparation observed several diatoms. In one preparation there was a piece of vegetable tissue composed of fine cells. In all there was much carbonised matter. A partial quantitative analysis gave the following result after complete drying in an air bath:—SiO_2 53·68, Al_2O_3 18·44, Fe_2O_3 6·54, CaO 0·95, MgO 1·52, K_2O 2·58, Na_2O 1·67. Loss on ignition, 14·60. Total, 99·98. I have been unable to find any analysis of dust borne any great distance by wind with which to compare this. A partial analysis of dust collected in England, given in a March number of your paper, does not differ much from this except that the loss on ignition is 36·4, and the other constituents correspondingly lower.

There is no doubt that this dust was derived from a desiccated surface; the carbonised matter suggests that it had been swept by fire, and as the weather all over New Zealand had been very wet for weeks previously, there is no possibility of a local origin of the dust.

Since Australia had just previously, after a period of most prolonged drought, suffered from the effects of severe gales, causing dust storms that produced almost total darkness in Melbourne and Sydney, it is natural to look to that continent for the origin of the dust storm. Through the kindness of Prof. J. W. Gregory, F.R.S., I was sent a specimen of dust that fell in Gippsland during a dust storm on October 11, and this, though coarser, was so essentially similar to our dust that a comparison of the two specimens at once established the extreme probability of identity of origin.

The distance in a straight line from Melbourne to Invercargill is 1200 miles, and to Dunedin 1300 miles, and from Sydney to Waipawa 1300 miles. The origin of the dust was probably some distance to the west of the Blue Mountains. There seems, therefore, no doubt that this dust was carried 1500 miles, 1200 of which was over a water surface.

Your readers are doubtless aware that the climate of New Zealand, and of Australia on its eastern seaboard, is chiefly dependent on the passage of deep cyclonic disturbances travelling in a general N.W.–S.E. direction. In front of the centre of these the wind blows strong from the N.W., and behind the centre from the S.W. The barometrical and weather records appended show that at the date mentioned such a cyclonic disturbance of rather more than the average intensity was experienced at the time of the dust fall.

In connection with this I may mention that after the famous "Black Thursday" in Melbourne, Dunedin and the southern portion of the south island of New Zealand generally experienced a dense smoke, and comparatively large fragments of carbonised vegetable matter fell.

In conclusion, I should like to point out the significance of such an observation as this in connection with the distribution of plants in the Southern Hemisphere. Since diatoms and vegetable particles of recognisable size were present in the very small portion of the dust examined, it seems quite possible that in the large total of dust that fell some of the smaller and lighter seeds of Australian plants may have been present.

Date. 1902	Barometer Brisbane.	Barometer Sydney.	Barometer Melbourne.	Barometer Adelaide.	Direction Hobart.	Barometer Hobart.	Direction Dunedin.	Barometer Dunedin.
Nov. 11	30·08	30·01	29·91	29·95	—	—	N.W.	29·72
Nov. 12	30·09	29·96	29·78	29·61	S.E.	29·9	S.W.	29·50
Nov. 13	29·96	29·53	29·63	30·03	W.	29·3	S.W. N.W. to S.W.	29·82 29·42
Nov. 14	29·98	29·90	30·04	30·27	—	—	N.E. to S.W.	29·50
Nov. 15	—	30·13	30·14	30·18	—	—	S.W.	29·92

P. MARSHALL.

Otago University, Dunedin, New Zealand, May 3.

Science and Naval Promotion.

THE friends of the advancement of science in the Navy can hardly fail to be very pleased with the recognition it has received in the recent promotions to the rank of commander. Of the twenty-seven lieutenants promoted on June 30 last, twenty-one were "specialised officers." In a batch of promotions such as this there is much to encourage our best officers to direct their attention to the more scientific work of their profession, yet one cannot but remark upon a feature in the analysis of these promotions, namely, the marked difference in the average times these new commanders remained lieutenants. Thus, three lieutenants (T) averaged 10 years; nine lieutenants (G) averaged 10·5 years; nine lieutenants (N) averaged 12·2 years. This is anything but encouraging to the specialist in navigation, but in view of the immense importance of securing the best men to navigate our fleets and handle them in action, it is much to be hoped that in future lieutenants (N) will not be so heavily weighted on their way to the higher ranks of the service. It is, however, only just to add that the theory and practice of navigation under recent legislation have been placed in a position in the front of scientific education they never occupied before. N. G. T.

Purple Flowers.

IT is generally thought that purple flowers are due to selection by bees, and the small number of blue and purple flowers in New Zealand is accounted for by the supposed

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